

INTERSTATE COMMERCE COMMISSION

WASHINGTON

REPORT NO. 3582

CHICAGO, ROCK ISLAND AND PACIFIC
RAILROAD COMPANY

IN RE ACCIDENT

AT HALLAM, NEBR., ON

JUNE 25, 1954

SUMMARY

Date: June 25, 1954

Railroad: Chicago, Rock Island and Pacific

Location: Hallam, Nebr.

Kind of accident: Derailment

Train involved: Passenger

Train number: 8

Engine number: Diesel-electric units 645,
750, and 637

Consist: 3 Locomotive units and
12 cars

Speed: 72 m. p. h.

Operation: Timetable, train orders, and an
automatic block-signal system

Track: Single; tangent; 1.0 percent
descending grade eastward

Weather: Clear

Time: 9:48 p. m.

Casualties: 189 injured

Cause: A false flange on a slid-flat driving
wheel, resulting from a seized
traction-motor pinion bearing on a
Diesel-electric locomotive unit,
which displaced a rail at a switch
location

Recommendation: That the Chicago, Rock Island and
Pacific Railroad take action to pro-
vide that an indication of any
slipping or sliding wheel on any
Diesel-electric unit in the locomotive
of a train will be shown in the control
cab

INTERSTATE COMMERCE COMMISSION

REPORT NO. 3582

IN THE MATTER OF MAKING ACCIDENT INVESTIGATION REPORTS
UNDER THE LOCOMOTIVE INSPECTION ACT OF FEBRUARY
17, 1911, AS AMENDED, AND THE ACCIDENT REPORTS
ACT OF MAY 6, 1910.

CHICAGO, ROCK ISLAND AND PACIFIC RAILROAD

August 20, 1954

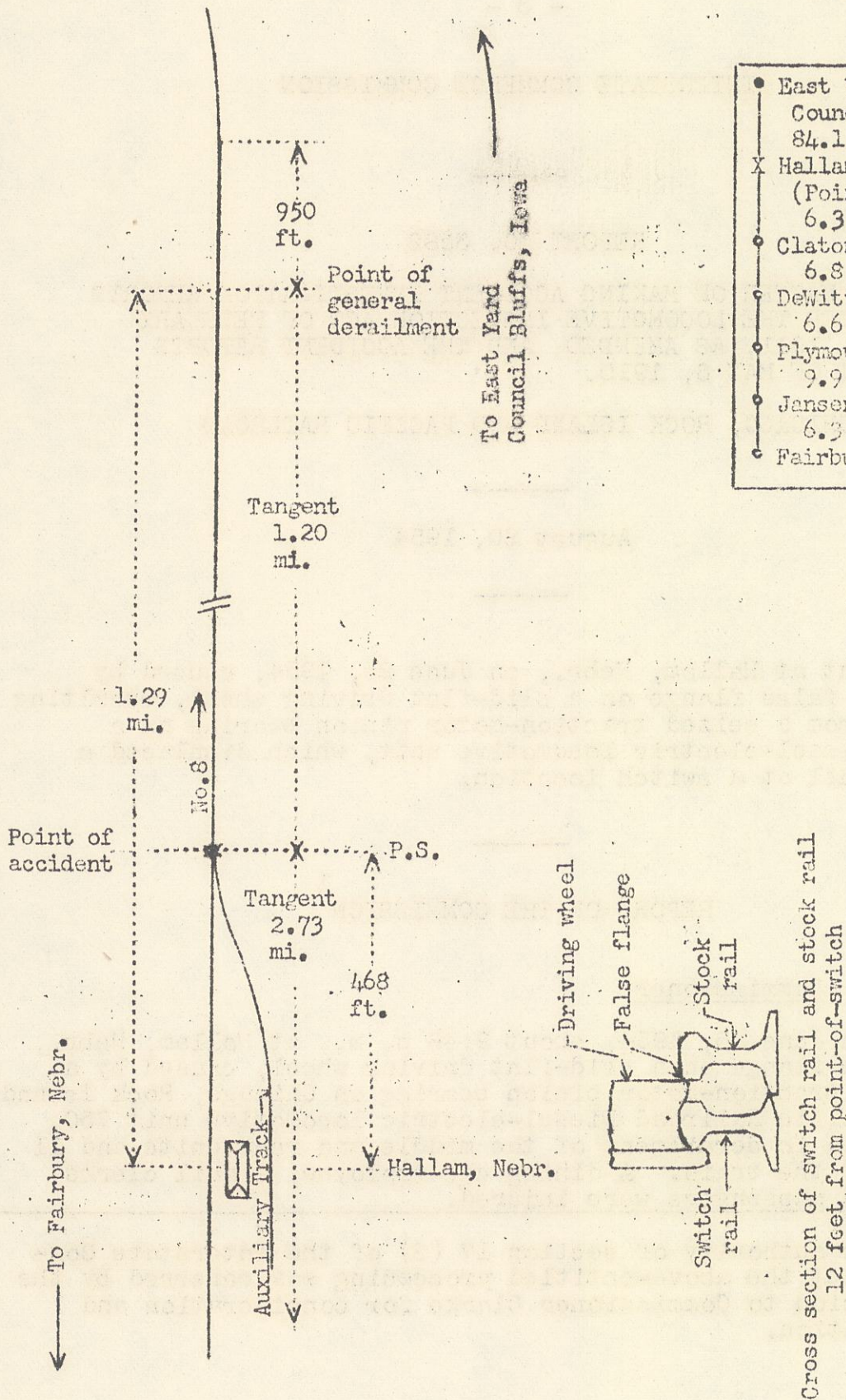
Accident at Hallam, Nebr., on June 25, 1954, caused by
a false flange on a slid-flat driving wheel, resulting
from a seized traction-motor pinion bearing on a
Diesel-electric locomotive unit, which displaced a
rail at a switch location.

REPORT OF THE COMMISSION¹

CLARKE, Commissioner:

On June 25, 1954, about 9:48 p. m., at Hallam, Nebr.,
a false flange on a slid-flat driving wheel, caused by a
seized traction-motor pinion bearing on Chicago, Rock Island
and Pacific Railroad Diesel-electric locomotive unit 750,
resulted in derailment of the middle and rear units and 11
cars of the train. A dining car employee, 4 mail clerks,
and 184 passengers were injured.

¹
Under authority of section 17 (2) of the Interstate Com-
merce Act the above-entitled proceeding was referred by the
Commission to Commissioner Clarke for consideration and
disposition.



Report No. 3582
Chicago, Rock Island and Pacific Railroad
Hallam, Nebr.
June 25, 1954

LOCATION OF ACCIDENT AND METHOD OF OPERATION

This accident occurred on that part of the Western Division extending between Fairbury, Nebr., and East Yard, Council Bluffs, Iowa, 120.0 miles. In the vicinity of the point of accident this is a single-track line, over which trains are operated by timetable, train orders, and an automatic block-signal system. At Hallam, Nebr., 35.9 miles east of Fairbury, an auxiliary track parallels the main track on the south. The east switch of this track is 468 feet east of the station. The accident occurred on the main track at the east auxiliary-track switch at Hallam. The main track is tangent throughout a distance of 2.73 miles immediately west of the point of accident and 1.38 miles eastward. The grade is approximately 1.0 percent descending eastward.

In the vicinity of the point of accident the track structure consists of 100-pound rail, laid new in 1950 on an average of 22 treated ties per rail length. It is fully tieplated with double-shoulder tieplates, single-spiked, and is provided with 4-hole 24-inch joint bars and an average of 6 rail anchors per rail. It is ballasted with chatts to a depth of 6 inches below the bottoms of the ties on sub-ballast of disintegrated granite.

This carrier's operating rules read in part as follows:

110. Running Inspection of Trains on Road.--
All employes must, as far as practicable, observe passing trains for defects.

Trainmen of freight and passenger trains, yardmen and operators must observe passing trains for defects.

Operators at intermediate stations, unless excused by train dispatcher, will stand on station platform when trains are passing.

Defects to be looked for include brakes sticking, wheels sliding, brake rigging down, swinging doors, hot journals, protruding objects, lading dangerously shifted, evidence of fire or any other condition which will endanger movement of train.

Employes noting such defects will give stop signals, and when communication with train dispatcher is possible, notify him of such defects.

If nothing irregular is noted, employes observing trains for defects will give proceed signals to the rear of the passing train.

When passing other trains, interlockings, open train order offices, coal, water or other stations, * * * train and engine crews must be on lookout for signals, and, when practicable, exchange signals.

111. Road Inspection for Defects. --When leaving stations, and at every opportunity on the road, conductors must carefully inspect and require their trainmen to carefully inspect the train for defects.

* * *

Engineers, firemen and forward trainmen must frequently look back and rear trainmen must frequently look ahead, especially when moving around curves, and approaching and passing stations, to observe signals and to note condition of train.

When approaching and passing through stations * * * and other places where safety requires, conductors and brakemen must, when practicable, station themselves where they can observe and transmit signals and assist in stopping train, if necessary.

* * *

In the vicinity of the point of accident, the maximum authorized speed for passenger trains is 79 miles per hour.

DESCRIPTION OF ACCIDENT

No. 8, an east-bound first-class passenger train, consisted of Diesel-electric units 645, 750, and 637, coupled in multiple-unit control, one baggage-mail car, one baggage car, two coaches, one club-dining car, two coaches, one dining car, three sleeping cars, and one observation sleeping car, in the order named. All cars were of lightweight steel construction. The locomotive units and all cars were equipped with tightlock couplers. This train departed from Fairbury at 9:17 p. m., 1 minute late, and passed the station at Hallam, the only open office between Fairbury and the point of accident, at 9:48 p. m., 1 minute late. While the train was moving at a speed of approximately 72 miles per hour, a false flange resulting from the sliding of the front wheels of the front truck of the second Diesel-electric unit engaged the inside surface of

the head of the south stock rail at the east auxiliary-track switch at Hallam. The south rail of the main track was canted outward by the rim of the wheel, and the wheel dropped inside the rail immediately east of the switch rail. The second and third Diesel-electric units, the first to the tenth cars, inclusive, and the front truck of the eleventh car were derailed at a point 1.2 miles east of the switch.

Immediately east of the point of general derailment the track is laid on a fill approximately 7 feet in height. The Diesel-electric units and the first car remained coupled and stopped with the front end of the locomotive 1,229 feet east of the point of general derailment. The second Diesel-electric unit stopped in line with the track. The third Diesel-electric unit and the first car stopped at an angle of about 15 degrees to the track with the rear end of the first car 26 feet north of the track. Separations occurred at each end of the second, fifth, and sixth cars. The second car stopped about 35 feet west of the first car, 34 feet north of the track and parallel to it. The third and fourth cars stopped on their right sides with the front end of the third car approximately 85 feet west of the second car and 50 feet north of the track, and the rear end of the fourth car approximately 60 feet south of the track. The fifth car stopped on its side, at an angle of 86 degrees to the track, with the front end toward the south and against the rear end of the fourth car. The sixth car stopped upright, across the track and at right angles to it, with the front end toward the north. The other derailed cars remained upright and stopped in diagonal positions on or near the south side of the track. The first 10 cars were considerably damaged, and the eleventh car was slightly damaged. Locomotive Unit 645, the leading unit, was not damaged in the accident and was continued in service.

Unit 750 did not sustain extensive damage. Brake rigging, piping, and electrical equipment under superstructure of car body were distorted and broken. The fuel tank was punctured and damage by fire to exterior of unit resulted. Emergency fuel cut-off valve was found tripped and in closed position. The No. 1 pair of wheels was damaged as hereinafter described, but the Nos. 2, 3, 4, 5, and 6 pairs of wheels were undamaged. All damage except that of No. 1 pair of wheels appeared to have occurred at time of derailment.

Unit 637 was also derailed, but was not damaged extensively. Several large openings were torn in left side of car body, and handholds, steps, brake rigging, piping, and electrical equipment under car body, were bent and distorted. Left Nos. 1 and 2 journal box pedestals of front truck were broken and twisted out of alignment. Wheels were not damaged.

The weather was clear at the time of the accident, which occurred about 9:48 p. m.

EXAMINATION OF TRACK

Examination of the track structure disclosed that throughout a distance of 24.2 miles immediately west of Hallam the welds of the bond wires on both rails had been scraped and cut intermittently. These marks became progressively heavier in the vicinity of Hallam. The top surfaces of frogs at turnouts at Plymouth, De Witt, and Clatonia, located, respectively, 19.7 miles, 13.1 miles, and 6.3 miles west of Hallam, were scored. Burned shavings and shards of metal were found in the vicinity of the west siding-switch at Clatonia and between that point and the point of general derailment. The south stock rail at the east auxiliary-track switch at Hallam had been forced outward, and the gage of the track at the switch points had been increased 2-1/4 inches. Between this switch and the point of general derailment the south rail was out of gage from 1-1/2 to 4 inches at the joints, the inside spikes had been partially withdrawn, numerous track bolts had been sheared off on the gage side of the rail, and the rail anchors had been dislodged from the rail. At a point 3,280 feet east of the switch the north rail was canted outward and the spikes on the gage side of the rail had been pulled upward a distance of 2 to 3 inches. East of the point of general derailment there were no marks similar to those which were found between Plymouth and Hallam.

DESCRIPTION OF LOCOMOTIVE UNITS INVOLVED

Unit 750, the second unit in the locomotive, headed in direction of movement, was built in June, 1940, at La Grange, Ill., by the Electro-Motive Division of General Motors Corporation. It was rebuilt in December, 1948, by the Chicago, Rock Island and Pacific Railroad and at the time of the accident was equipped with one E.M.D. model 12-567 engine and one E.M.D. model 12-567-A engine, both 2-cycle, V-type developing 1000

H.P. at 800 r.p.m. and each direct connected to an E.M.D. type D-4 generator. Construction and control design permitted use as either a leading or a trailing unit. The wheels had specified new diameter of 36 inches. Wheel arrangement was A1A-A1A. Total weight on driving wheels was 214,900 pounds and tractive effort was 47,000 pounds. The brake was Westinghouse H.S.C. modified. This unit was designed for maximum speed of 98 miles per hour.

The two trucks of unit 750 were of the swing bolster type and each had a wheel base of 14 feet 1 inch. Each truck had three pairs of wheels; the front and rear axles were motor driven and the idle middle or intermediate axles were load-carrying only. Each of the traction motors was carried by axle support bearings on one side and a spring cushioned nose support on the opposite side. No. 1 motor, in which bearing seizure occurred, had been converted from type D-7 to type D-27B when rebuilt by the manufacturer and had been installed in the front truck at Chicago, Ill., on March 13, 1954. Gear ratio was 55-22. The armature shaft was supported by Hyatt grease-sealed roller bearings, which were so designed that no lubricant could be added except by removal of the cover plate or when the motor was dis-assembled. The locomotive builder had established a warranty of 100,000 miles, and the practice of the railroad was to overhaul the traction motor and renew lubricant after each 400,000 miles service. Motor mileage at time of accident was 97,004.

Unit 750 was equipped with a wheel-slip relay which functioned only when the traction motors were in series connection. Unit No. 645 was equipped with a wheel-slip relay which functioned in all transition stages.

EXAMINATION OF PARTS INVOLVED

The front wheels of the lead truck under unit 750 had been extensively damaged by frictional contact with the rails. At undamaged locations on the right wheel the thickness of the rim and flange was 2-13/16 and 1-3/16 inches, respectively, and the flange height was 1-3/8 inches. At the points where the greatest amount of sliding had occurred depths of flat spots were 43/64 and 35/64 inches on right and left wheels respectively. At several other points on the tread of the right wheel there were smaller slid-flat spots ranging in length from 1-1/2 to 4 inches which were located opposite corresponding spots on the left wheel. The rim of the right wheel had been greatly overheated, the metal had been pulled

and rolled and numerous small chips had been separated from the wheel and were found at various locations along the track. Across the outer edge of the wheel rim the rail had cut three deep parallel chords, $\frac{3}{4}$ inch wide, $\frac{5}{8}$ inch deep, and from 10 to $23\frac{1}{2}$ inches in length. The left wheel was not so extensively damaged. The largest slid-flat spot was $\frac{35}{64}$ inch deep, 3 inches wide, and 8 inches long. The thickness of the undamaged portions of the rim and flange was $2\frac{7}{8}$ and $1\frac{1}{4}$ inches, respectively, and the flange height was $1\frac{3}{8}$ inches. The flange adjacent to the 8-inch flat spot had been flattened for a distance of $13\frac{1}{4}$ inches.

These wheels were multiple-wear wrought steel and were mounted on an axle having $6\frac{1}{2}$ x 12 inch journals. Hot stencil marks were 11 53 E A 856199 A on the right wheel and 11 53 E A 856154 A on the left. The wheels were manufactured in November, 1953, by the Edgewater Steel Company and were, as the stencil indicated, Class A wheels with carbon content not over 0.63 percent. The wheels had been applied new at Chicago, Ill., on March 13, 1954, and at the time of the accident had run 97,004 miles.

Number 1 traction motor support bearings were in good condition.

The traction motor was torn down at Silvis, Ill., shop on July 9, 1954, for examination. No lubricant was found in the motor bearing at the pinion end. The bearing at opposite end of the armature shaft, the commutator end, was found to be well lubricated and in good condition. The failed pinion bearing showed evidence of extreme overheating; the seal ring had been partly melted and was fused to the end cover, necessitating use of an acetylene cutting torch to separate the cover from the bearing assembly. The inner bearing race had been greatly overheated, was very rough, and had one irregular shoulder approximately $\frac{1}{4}$ inch wide and $\frac{1}{16}$ inch high extending around the entire circumference. This shoulder had cut a corresponding groove in the rollers. No rollers were broken but all were badly damaged because of excessive heat and lack of lubrication. Each roller had a slid-flat surface along its entire length which varied in width on different rollers. The retaining ring was broken into numerous pieces, 11 rollers fell free when the bearing was removed, and 3 remained stuck in the outer race. The extent of damage to the seized bearing precluded determination of the cause of absence of lubricant or failure of the bearing.

After the accident the wheel-slip relay on unit 750 was tested at Martell, Nebr., 3 miles from point of accident. An electrician found that the wheel-slip relay in the lead truck circuit moved freely and the warning light flashed. Later, at Silvis, Ill., the relay and light were tested through jumpers at each end of the unit and found to function as intended. Both wheel-slip relay and ground relay connections were found to agree with the wiring diagrams. Tests of wheel-slip relay and warning light of unit 645 were made at Chicago, Ill. after the accident by means of control cables and these devices functioned properly.

A general electrical foreman stated that his examination of the generator which supplied current to the damaged traction motor disclosed no indication of an electrical flash over and that it was his opinion the generator was not loading immediately before the traction motor locked. He further stated that during his examination of the wheel-slip and ground relays they functioned properly and were connected in accordance with wiring diagrams.

INSPECTION AND REPAIR REPORTS

Unit 645 received annual inspection on May 16, 1954, and last monthly inspection on June 17, 1954. Unit 750 received annual inspection on August 19, 1953, and last monthly inspection on June 8, 1954. Unit 637 received annual inspection on February 18, 1954, and last monthly inspection on June 15, 1954. All inspections were made at Chicago, Ill.

Daily inspection and repair reports from May 1, 1954, to date of accident, on file at Denver and Colorado Springs, Colo., and Chicago, Ill., principal maintenance points, and reports from the division terminals through which unit 750 had been operating in extended service, together with Routine Maintenance Work Sheets, were examined. Nothing was found reported which would have any bearing on the accident.

SUMMARY OF EVIDENCE

The train arrived at Fairbury, Nebr., at 9:08 p. m. where locomotive units were serviced and engine crews changed. No defective locomotive conditions were reported by the incoming engine crew. Time of departure was 9:17 p. m.

The engineer stated that the wheel-slip relay light flashed several times during transition as the train departed from Fairbury, after which no further wheel-slip indication occurred, and that between Fairbury and Hallam he inspected the train in accordance with rule requirements and did not observe any indication of sliding wheels. He said the train passed Hallam at a speed of approximately 72 miles per hour. He first became aware that something was wrong when the general derailment occurred.

The fireman stated that he had inspected all units at Fairbury and then proceeded to his station in the control cab upon departure; that he again patrolled the units en route when the train was between De Witt and Clatonia and did not observe any defective condition; that he inspected the train as required but saw nothing to indicate sliding wheels; and that he thought sparks, if thrown, might have been hidden by the pilot on unit 750.

The members of the train crew stated that they made frequent inspections of the equipment on curves and saw no sparks or other indications of sliding wheels or defective equipment. The conductor and the front brakeman, who were in the third car, said that they felt an irregular movement of the car after it passed the east auxiliary-track switch at Hallam. The derailment occurred before they could take action to stop the train.

The operator at Hallam was on the station platform and inspected the equipment of No. 8 as the train passed. He said he observed sparks under the train which he thought would normally result from a brake application. When the rear of the train passed he gave a proceed signal. He said that several minutes later a person who had watched the train pass from a point a short distance east of the station informed him he thought that the train was on fire or that a journal had exploded. The operator immediately notified the train dispatcher.

After the accident occurred employees learned from residents of the vicinity that sparks were being thrown from under the locomotives as the train passed Jansen, 29.6 miles west of Hallam, and that there was a severe pounding noise as the train passed Plymouth. An employee who was not on duty said he saw a small amount of sparks near the front of the train as it passed over a street crossing near the station at Hallam.

DISCUSSION

At the time the accident occurred No. 8 was composed of the locomotives and cars of trains which had originated at Denver and at Colorado Springs, Colo., and had been combined at Limon, Colo. Denver, Colorado Springs, and Limon are located, respectively, 501.0 miles, 490.0 miles, and 411.2 miles west of Hallam. At Limon a three-unit locomotive was formed by coupling Diesel-electric unit 645, which had powered the train originating at Denver, to the front end of Diesel-electric unit 750, which, coupled back to back with unit 637, comprised the locomotive of the train originating at Colorado Springs. The average speeds of the locomotive units involved between their points of origin and the point of accident were 50 miles per hour for Diesel-electric unit 645, and 50.7 miles per hour for Diesel-electric units 750 and 637.

Evidence developed during the investigation indicates that the traction-motor pinion bearing on unit 750 first seized shortly after the train left Fairbury and that intermittent seizure occurred for some distance thereafter until complete failure and seizure of the bearing occurred and the wheels became locked. The resulting slid-flat spots formed false flanges on the outer edges of the treads of both wheels. The false flange on the left wheel was approximately 35/64 inch in height. The tread and rim of the right wheel was so distorted by contact with the gage side of the south rail that the extent of the false flange before the derailment occurred could not be determined. However, marks on the track structure indicated that, as a result of the slid-flat spot, the outer edge of the tread was lowered sufficiently to mark the welds of bond wires on the outside of the head of the rail and to permit the rim of the wheel to engage the gage side of the head of the stock rail at the auxiliary-track switch. When this occurred the south rail was forced outward and the flange of the companion wheel adjacent to the slid-flat spot was forced heavily against the north rail. This portion of the flange became worn sufficiently to permit the wheel to cross the rail at a point 1.2 miles east of the switch. The general derailment occurred as a result of the ensuing damage to the track.

Transition from series to parallel occurred on unit 750 at speeds of from 22 to 27 miles per hour. After transition from series to parallel occurred following the departure of No. 8 from Fairbury, the speed of the train was not reduced

sufficiently for the motors to return to series operation at any point west of Hallam. The wheel-slip relay with which unit 750 was equipped functioned only when the motors were in series, and consequently after transition from series to parallel there would be no indication in the control compartment of the locomotive that wheels on this unit were sliding, neither would there be any such indication if an engine in the unit were idling and its generator not loading.

CAUSE

This accident was caused by a false flange on a slid-flat driving wheel, resulting from a seized traction-motor pinion bearing on a Diesel-electric locomotive unit, which displaced a rail at a switch location.

RECOMMENDATION

It is recommended that the Chicago, Rock Island and Pacific Railroad take action to provide that an indication of any slipping or sliding wheel on any Diesel-electric unit in the locomotive of a train will be shown in the control cab.

Dated at Washington, D. C., this twentieth day of August, 1954.

By the Commission, Commissioner Clarke.

(SEAL)

GEORGE W. LAIRD,
Secretary.